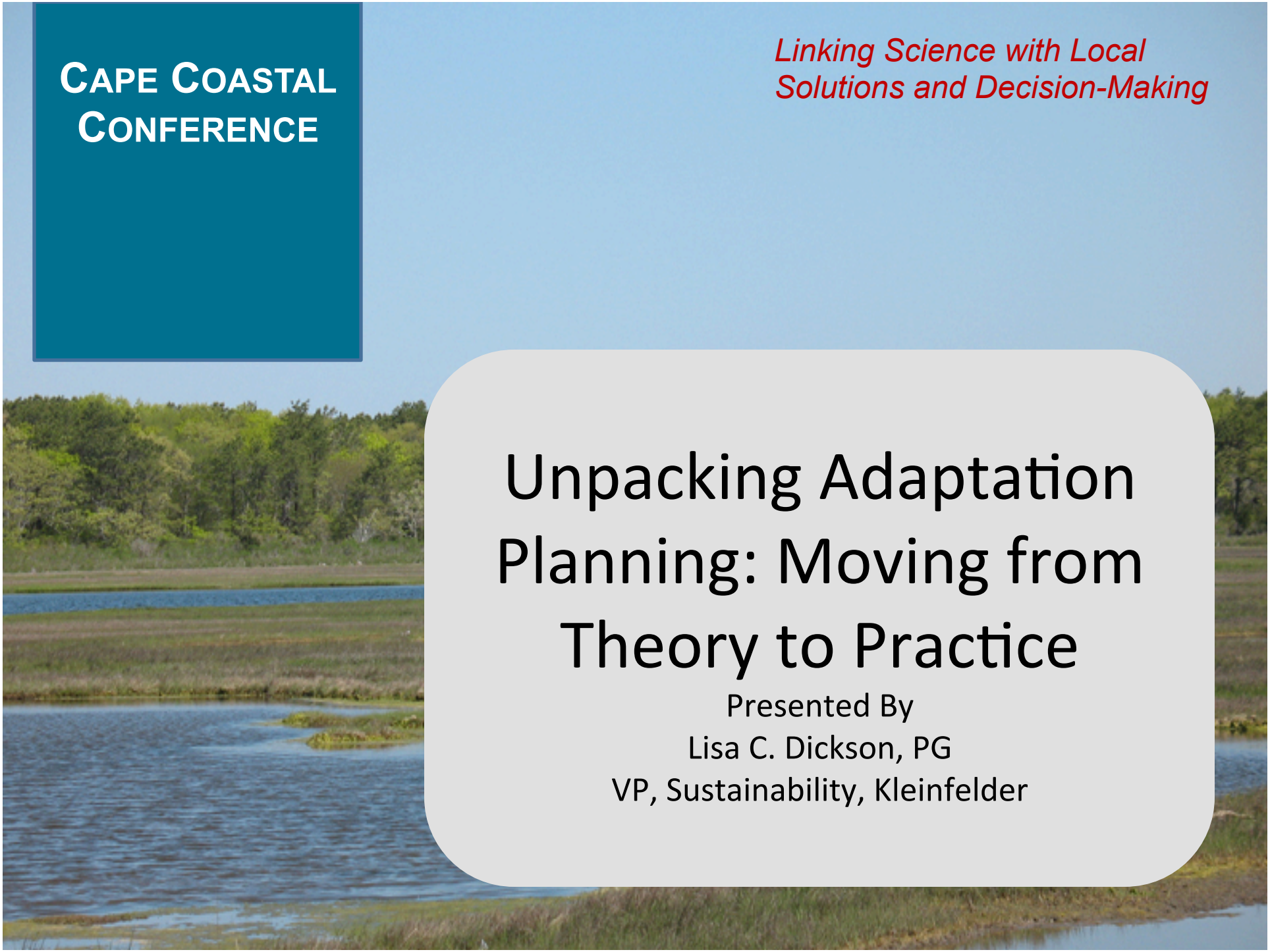


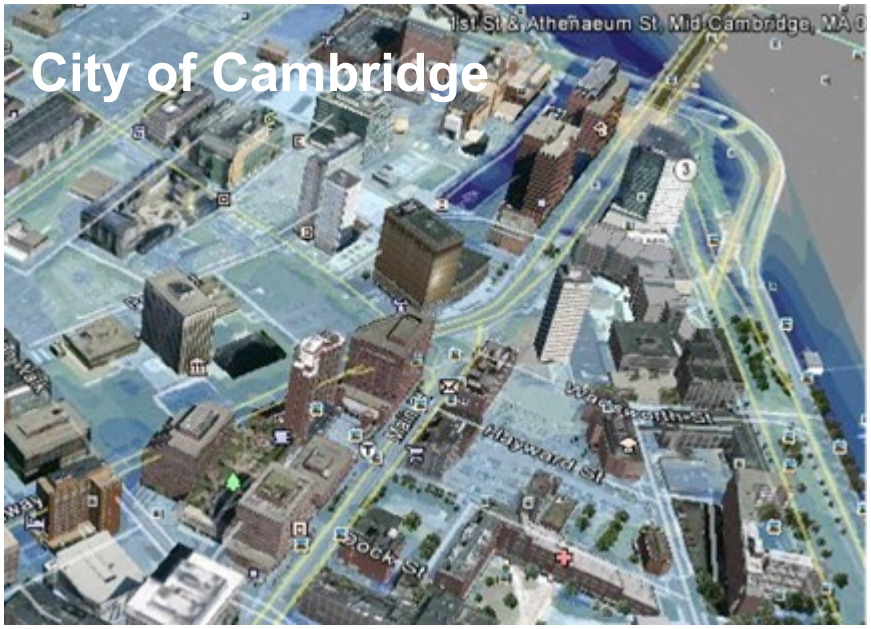
CAPE COASTAL CONFERENCE

Linking Science with Local Solutions and Decision-Making

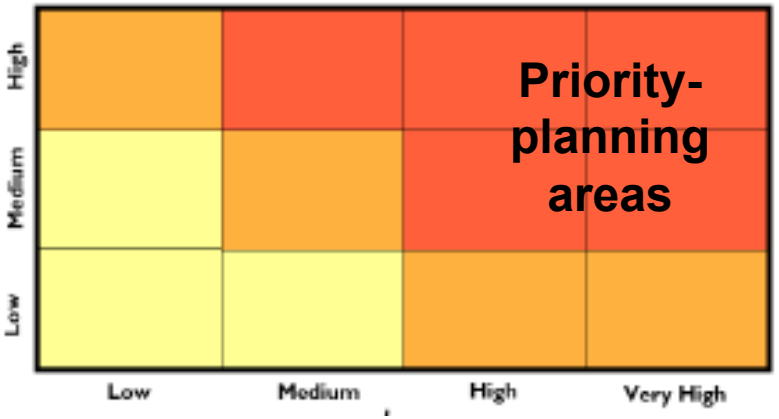
Unpacking Adaptation Planning: Moving from Theory to Practice

Presented By
Lisa C. Dickson, PG
VP, Sustainability, Kleinfelder

Climate Change Project Experience



Climate Change Projects



Step 1

Climate Projections

Scenario Development

Step 2

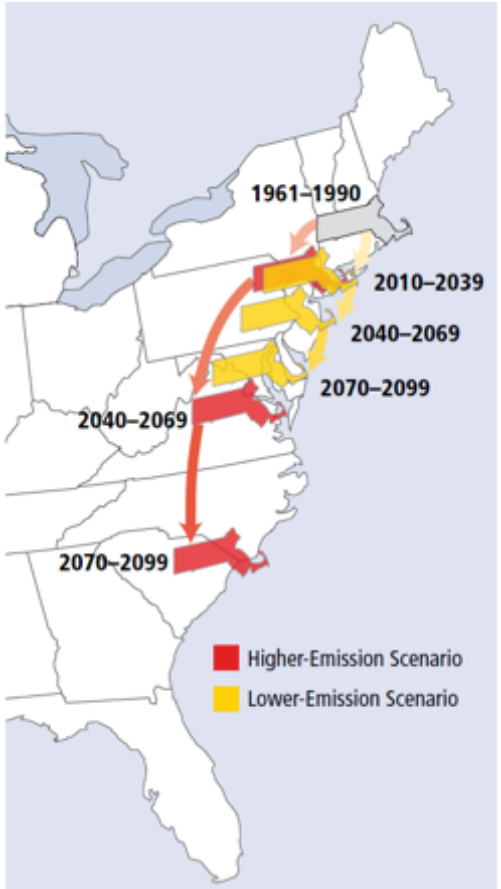
Vulnerability & Risk Assessment

Step 3

Adaptation Planning and Design

Step 1a: Climate Projections

Temperature



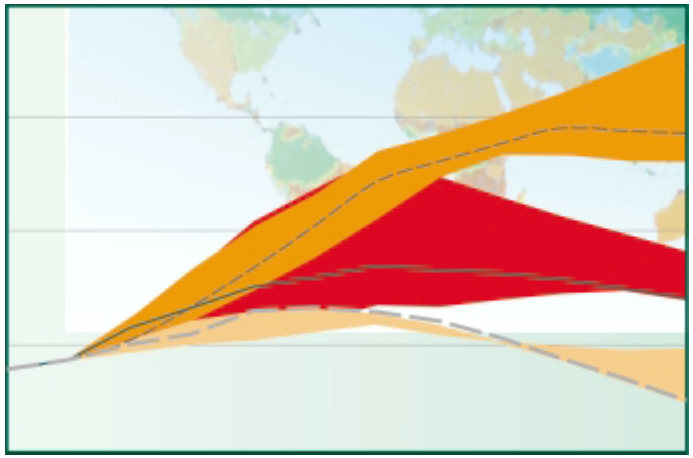
Precipitation

Extreme events

Sea level rise

Step 1b: Scenario Planning

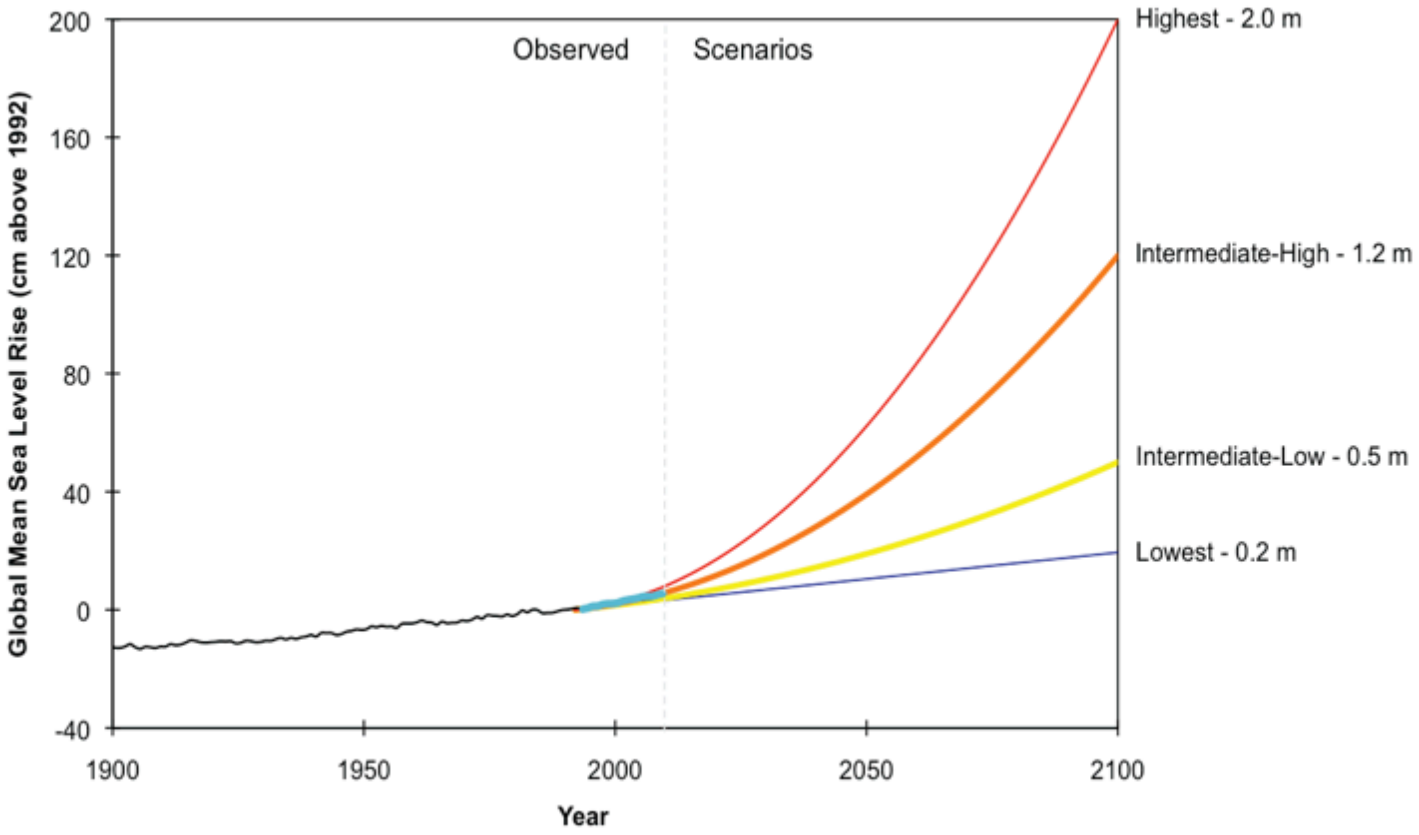
Possible futures



GHG emission scenarios

Climatic parameters

Sea Level Rise



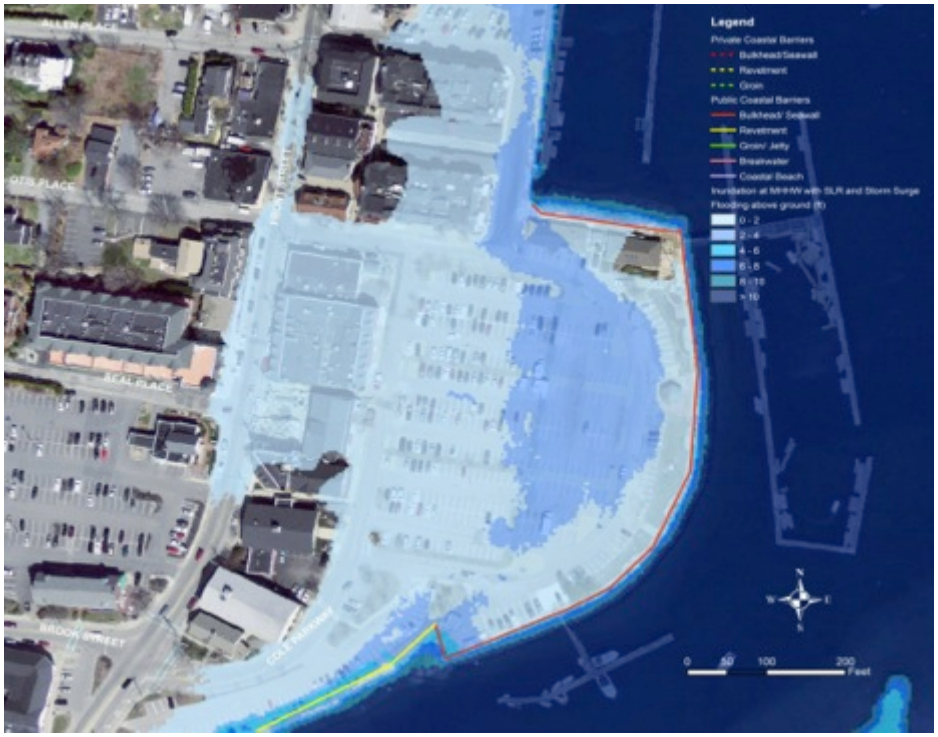
Global mean sea level rise scenarios provided by NOAA as part of the National Climate Assessment report published in December 2012. The “Highest” scenario with local subsidence was used for inundation modeling in South Shore.

Storm Surge

Sea Level Rise Only

SLR of 1.08 ft by 2038

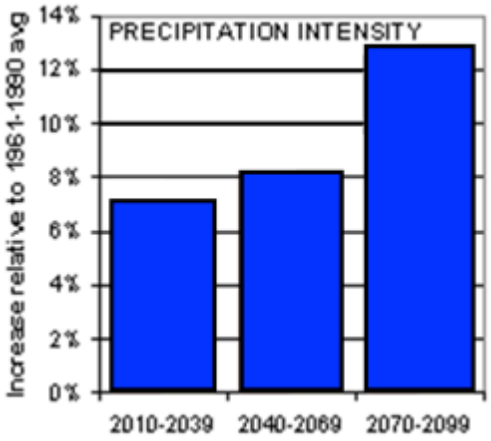
Sea Level Rise and Storm Surge



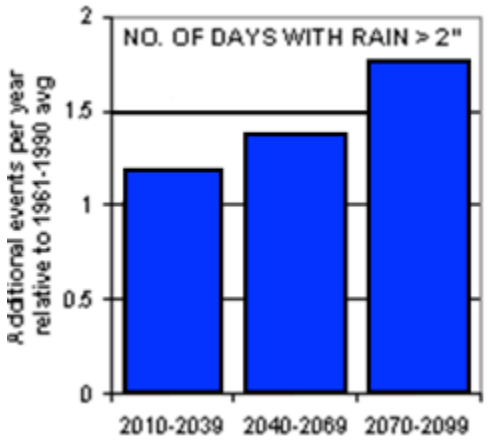
SLR of 1.08 ft by 2038 and
Storm Surge from Category 1 Hurricane

Scituate Harbor

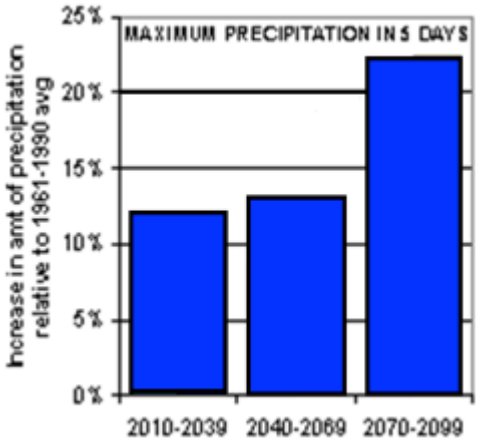
Precipitation



Precipitation Intensity



Precipitation Frequency



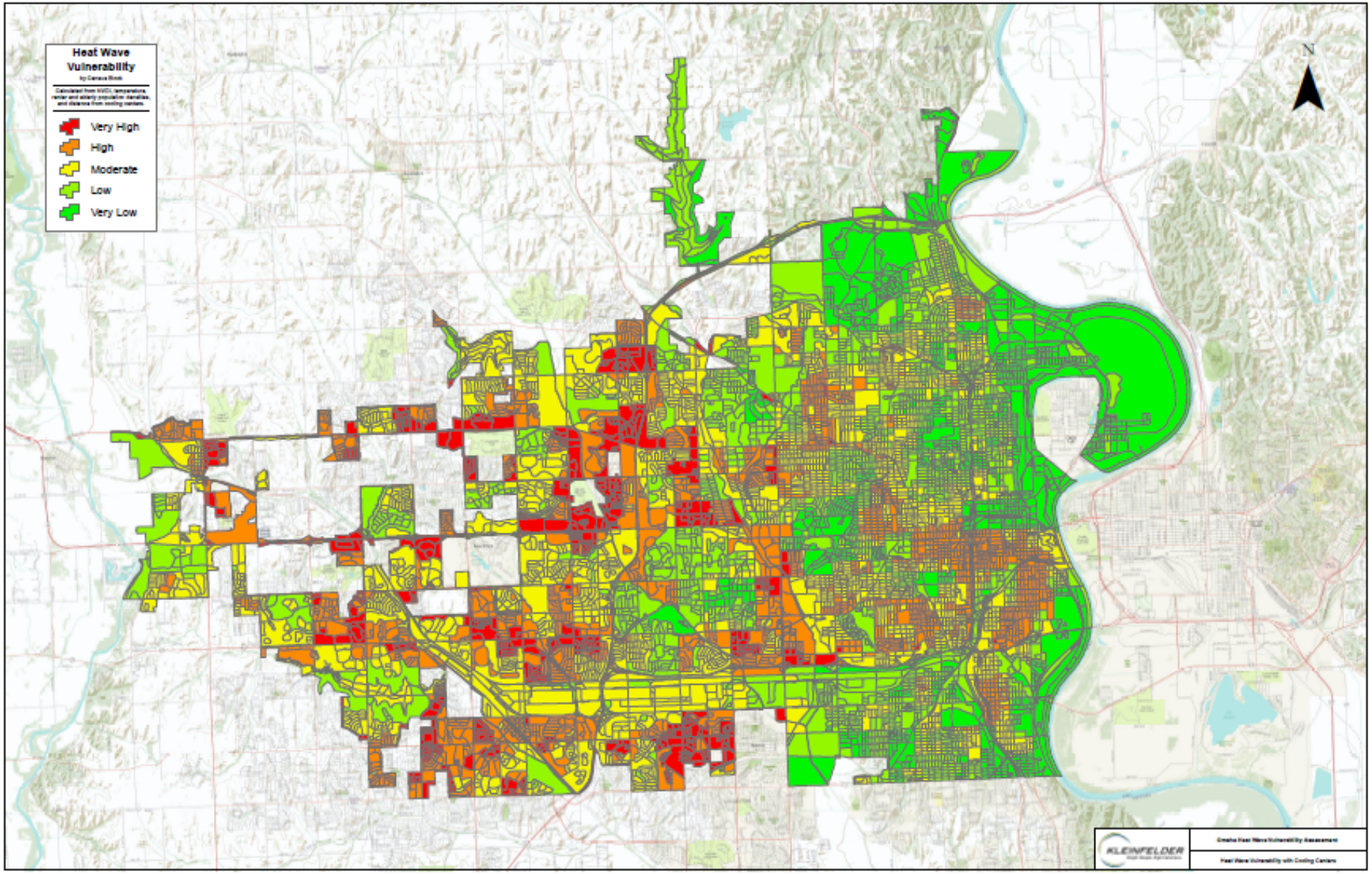
Precipitation Volume

- Overall average annual precip volumes remain the same
- More frequent and intense extreme precipitation events

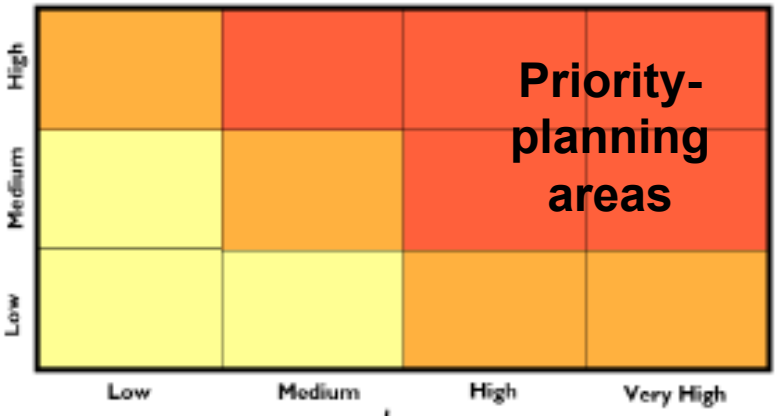
Comprehensive Water Model

Linking Surface Water, SLR & Piped Infrastructure

Heat Wave Vulnerability



Climate Change Projects



Step 1

Climate Projections

Scenario Development

Step 2

Vulnerability & Risk Assessment

Step 3

Adaptation Planning and Design

Step 2: Identify the Targets

- **Infrastructure**
- **Critical Services**
- **Public Health**
- **Economic**
- **Natural systems**
- **Insurance/Legal**
- **Social Resiliency**

Assets & Resources

Infrastructure:
Energy:
- Electricity& Gas (NSTAR)
- Steam (Veolia)

Transportation:
- Highways, bridges & roads (Mass DOT)
- Local roads including pathways (City, DCR)
- Transit: subways, buses and commuter rails (MBTA)
- Parking (City & private)

Water & Waste Water
- Water Supply & Distribution
- Stormwater system
- Sewer system

Critical Infrastructures
- Public safety
- Hospitals
- Child Care & Elderly Center

Telecom./ IT

Public Health:
Variables:
- Heat/temperature vulnerabilities
- Air Quality
- Disease Vectors

Economic:
Variables:
- Infrastructure conditions
- Service offerings
- Economic indicators / economic activity
  - Retail Goods and services
  - Ridership at relevant T-stations (who can get to work or not)
  - Number of employees

Natural systems:
- Urban forestry
- Habitat

Step 2a: Vulnerability Assessment

		Sensitivity: Low → High				
		S0	**S1**	**S2**	**S3**	**S4**
Adaptive Capacity Low ↓ High	**AC0**	V2	V3	V4	V5	V5
	AC1	V1	V2	V3	V4	V5
	AC2	V1	V1	V2	V3	V4
	AC3	PO	V1	V1	V2	V3
	AC4	PO	PO	PO	V1	V2

Analysis of individual assets

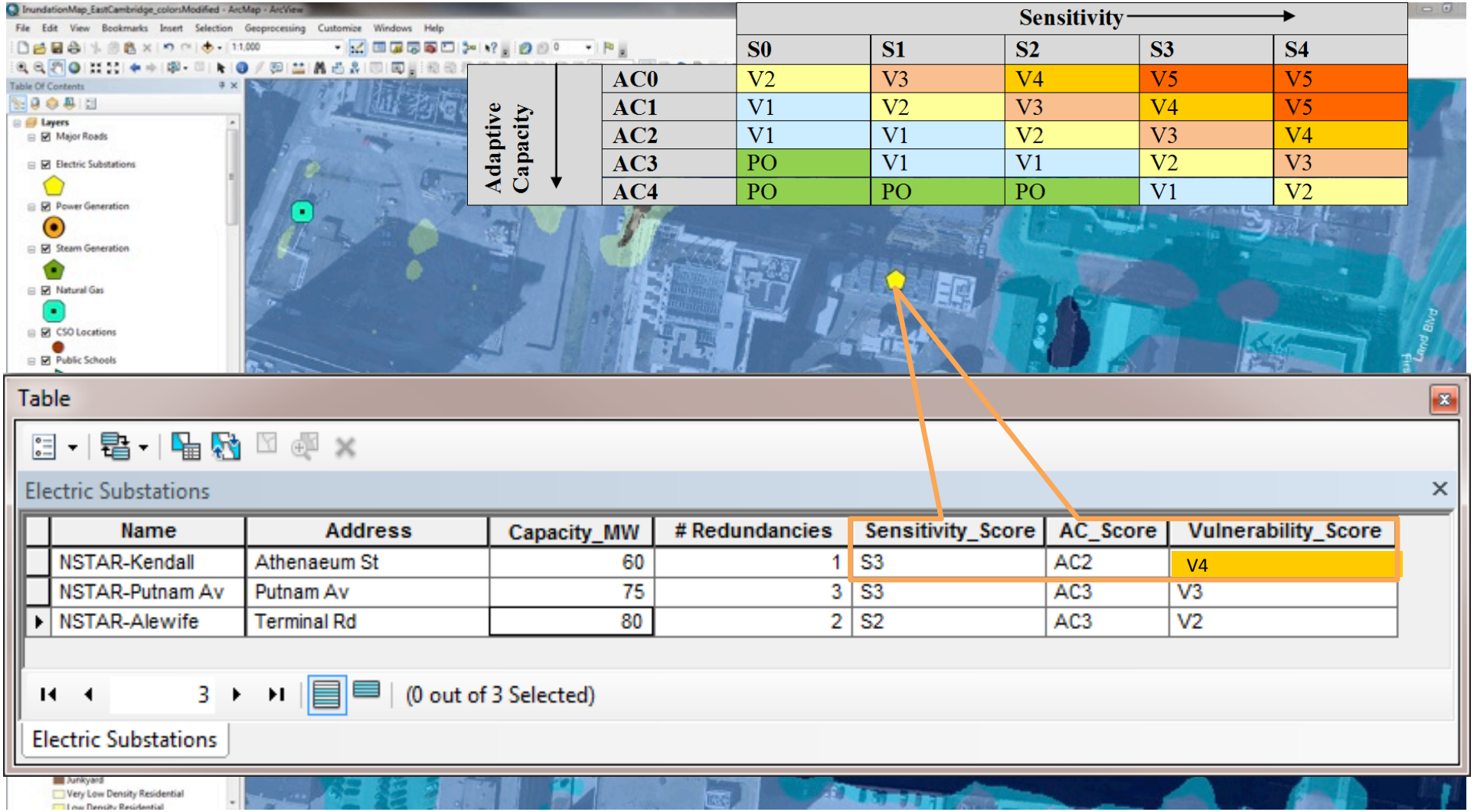
Step 2b: Risk Assessment

I = Infrastructure Consequence, T = Training Consequence, O = Operations Consequence.

Magnitude of Consequence	More likely than not	Likely	Very likely	Extremely likely
High	Aviation (O)	Power plant (I)	Electrical Utilities (I) Heat exhaustion for training (T) Heat exhaustion for operations (O) Storm damage for infrastructure (I)	Transportation system (I) Evacuation (O) Access (O)
Medium	Structural damage to Railroad bridge (I)	Wastewater treatment (I) Storm damage for operations (O)	Electrical utility cost (I) Infrastructure flooding for operations (O)	Damage to physical infrastructure from flooding (I)
Low	Water quality (I)	CSO discharge (I)		

Probability/Likelihood of Occurrence of Consequence →

Linking GIS and Vulnerability



Adaptive Capacity	Sensitivity → S0	S1	S2	S3	S4
AC0	V2	V3	V4	V5	V5
AC1	V1	V2	V3	V4	V5
AC2	V1	V1	V2	V3	V4
AC3	PO	V1	V1	V2	V3
AC4	PO	PO	PO	V1	V2

Table

Electric Substations

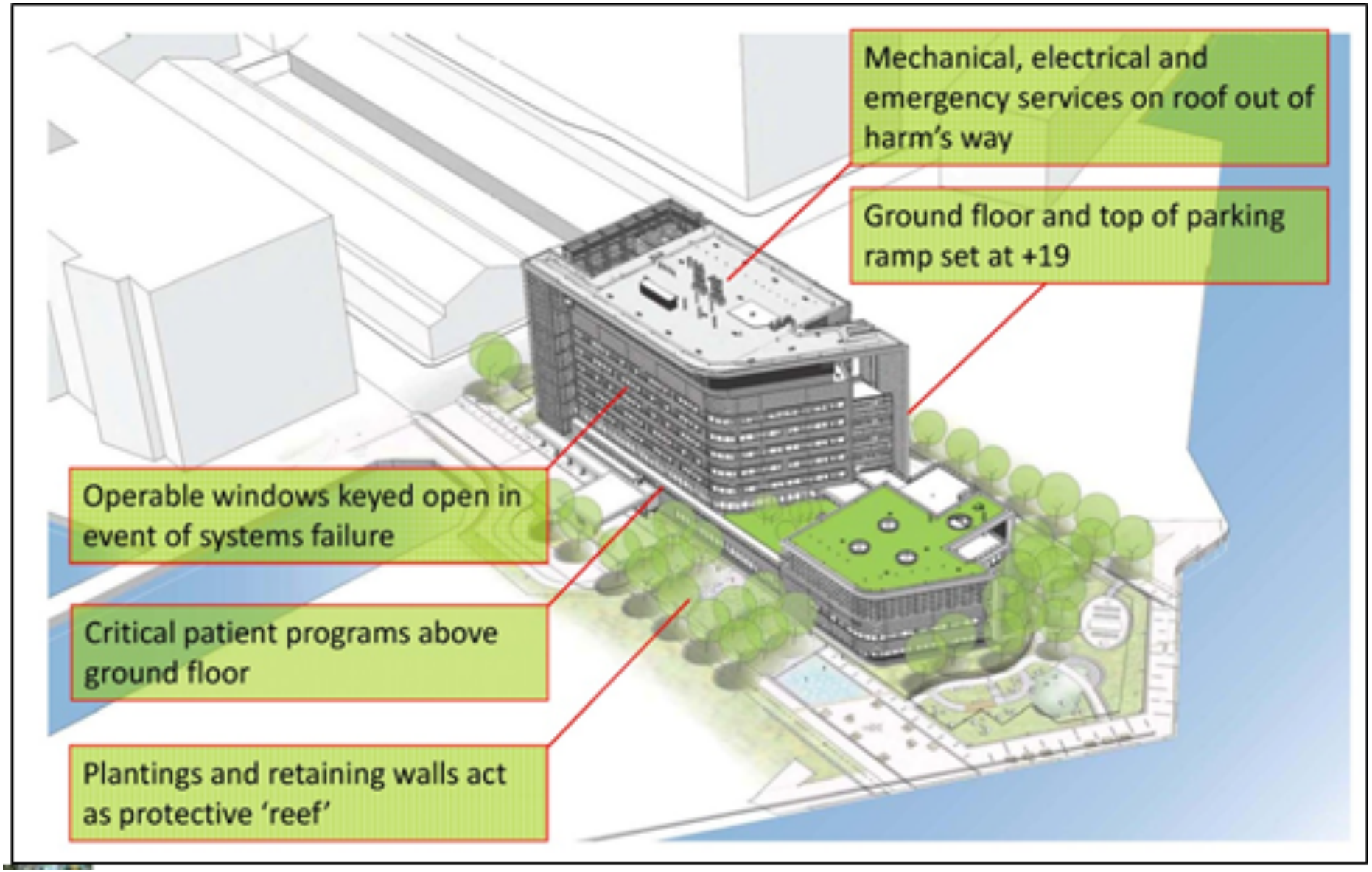
Name	Address	Capacity_MW	# Redundancies	Sensitivity_Score	AC_Score	Vulnerability_Score
NSTAR-Kendall	Athenaeum St	60	1	S3	AC2	V4
NSTAR-Putnam Av	Putnam Av	75	3	S3	AC3	V3
NSTAR-Alewife	Terminal Rd	80	2	S2	AC3	V2

3 (0 out of 3 Selected)

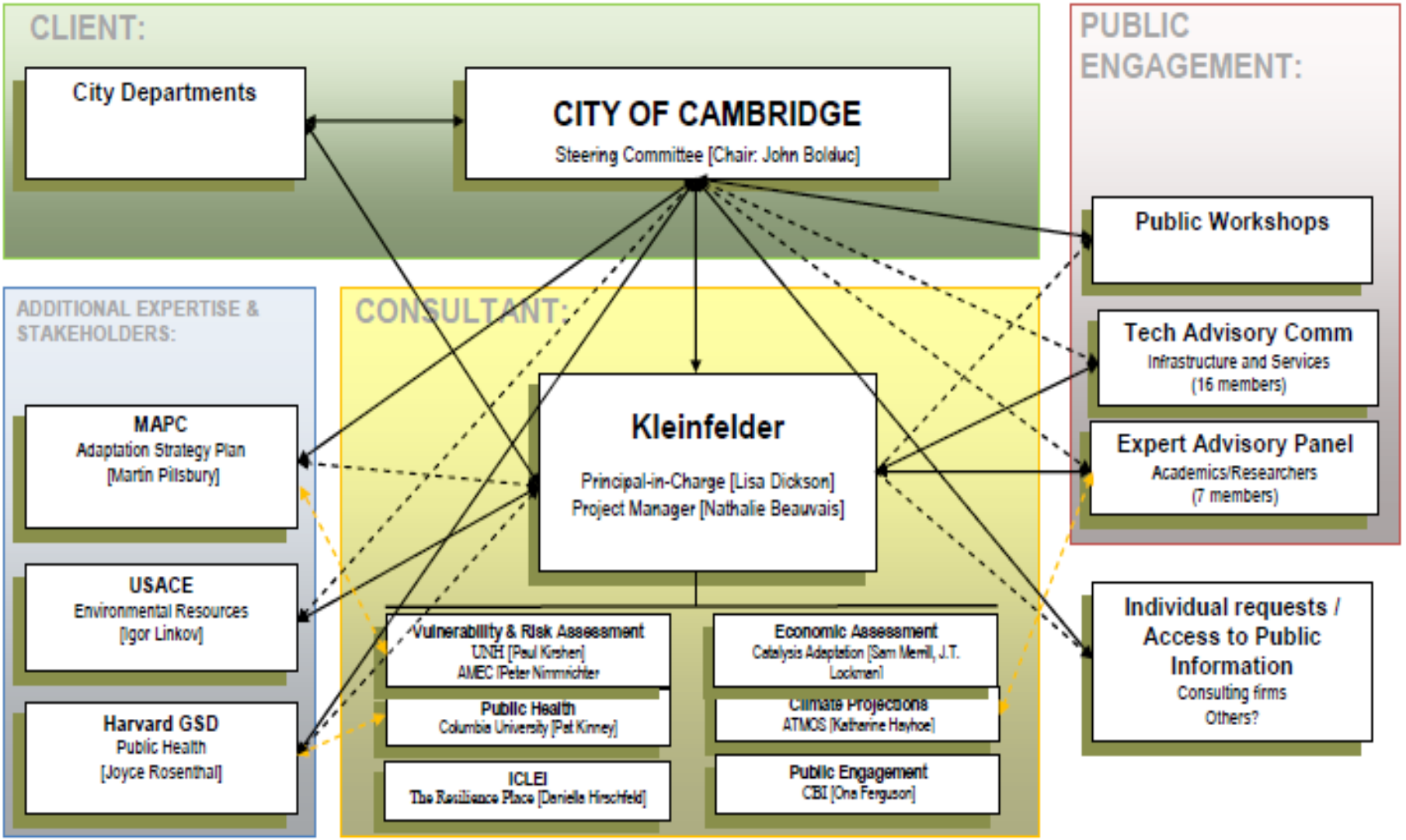
Electric Substations

Risk Assessment

Partners HealthCare risk assessment
BUILDING ADAPTATION – Spaulding Hospital, Charlestown



Stakeholder Engagement



Questions/ Discussion